

insists upon the importance of detecting it at an early stage, and in the first part of the pamphlet he explains how to do this with certainty.

The pamphlet ought to be read by everyone interested in agriculture: and to make it better known the Society has printed as a leaflet a few notes upon the subject. In America the pamphlet would be sent broadcast amongst those interested, and it is to be hoped that Government assistance may soon enable our own Agricultural Society to disseminate knowledge in a similar way.

W. T.

How to Make Common Things. By John A. Bower. (Society for Promoting Christian Knowledge, 1892.)

IT would be a strange boy who never wanted "to make something." The present little book has been prepared for boys who feel this desire very strongly, but do not quite know how to set about the fulfilment of their wish. They will here find ample information on the best way of making a vast number of things, from a hat-rail to a galvanometer, from a pair of stilts to a needle-telegraph. The author assumes throughout that those whom he addresses are not being taught by a personal instructor in handicrafts, and that they are not the possessors of an elaborate array of tools. His directions are clear and practical, and cannot fail to be appreciated by boys who find much to interest them in the exercise of ingenuity and manual skill.

The Student's Manual of Deductive Logic, Theory and Practice. By K. R. Bose. (Calcutta: S. K. Lahari and Co., 1892.)

THIS book is intended for the use of students at the various Indian colleges, and will be regarded by most teachers of the subject as, upon the whole, a very good text-book. The author has read many of the best European writers on logic, and presents clearly a summary of their results. He begins with a definition of logic, gives some account of its "branches and parts," and then considers terms, propositions, and inferences. What he himself describes as "the distinguishing feature" of the book is a collection of problems and exercises with solutions, or hints towards solution, in close correspondence with the subject-matter of the text.

A Text-Book of Agricultural Entomology. By Eleanor A. Ormerod. Second Edition. (London: Simpkin, Marshall and Co. 1892.)

THE first edition of this book was published about eight years ago. It consisted of lectures which the author had delivered at the Institute of Agriculture of South Kensington. There was not much demand for it until last year, when attention was directed to it by the arrangements of the County Councils for the promotion of agricultural education. The work was then so widely appreciated that a new edition was soon called for, and there can be no doubt that in its new form it will be more popular than ever, for Miss Ormerod has done everything in her power to make it not only scientifically accurate but practically useful. Students will find it of great service in helping them to a knowledge of insect life and of the best remedies for "infestations."

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

A Functional Hermaphrodite Ascidian.

AS of late years a considerable number of structural hermaphrodites have been shown to be protogynous or prot-

androus, or to have some special modification for the purpose of preventing self-fertilization, it may be of interest to have on record a case of a completely functional hermaphrodite.

I had living lately in one of my dishes a large *Ascidia* (probably *A. rubicunda* of Hancock) which I observed one morning to be expelling eggs from the atrial aperture. The eggs were emitted in batches of from about twelve to twenty at a time, and immediately after each set of eggs came a little white milky jet which hung like a string in the water for a few seconds and then spread out and disappeared. On catching some of this string in a pipette and examining it with the microscope it was seen to be a mass of active spermatozoa. This alternating passage of ova and spermatozoa continued for fully an hour.

The ova at first floated at the surface of the water for a short time and then slowly sank to the bottom. On examining some of those on the bottom of the dish after a couple of hours they were found to have commenced development, being in various stages of segmentation: so there can be no doubt that self-fertilization had taken place.

Very likely this occurs in some other species also, but another common Ascidian (*Corella parallelogramma*), of which I had had several large specimens living a few weeks before, laid eggs in my dishes, and I could not detect any spermatozoa being produced by these individuals. They were functionally female although structurally hermaphrodite.

W. A. HERDMAN.

University College, Liverpool, October 3.

The Present Comets.

ON the 27th ult. about 15^h. G.M.T. comet Brooks (*c*, 1892) had a tail 10' long, pointing at a position-angle of 280°.

At the latter part of last month Swift's comet (*a*, 1892) was still a very conspicuous object in a 4 $\frac{1}{2}$ -inch refractor. Observations on several nights showed that it not only still had a very faint tail—at position-angle 260° on the 24th at 8^h, when I observed it to be certainly 11' long, and suspected it to 21'—but that also there was an elongation nearly in the opposite direction; while I believe the radius of the head was less towards *n* than towards *s*, but I have not been able to satisfy myself of this.

Sunderland, October 5.

T. W. BACKHOUSE.

Women and Musical Instruments.

IN looking over a very large collection of musical instruments from the aborigines of America, I am surprised to find that there is not one peculiar to women, and that those of the men are never played by the women. It is true that the females beat time on various objects and may now and then use the rattle. This disappointing fact arrested my attention, and I am curious to know whether savage women, or any other women for that matter, have ever invented a musical instrument, and whether in savagery they even play upon those invented by the men. The composition and singing of songs might also be inquired into, though our American savage women do join in certain choruses.

OTIS T. MASON.

Washington, U.S.A., September 26.

Determination of *g* by Means of a Tuning Fork.

MR. C. V. BOYS informs me that for the converse process of determining the pitch of a tuning-fork, the experiment I described recently is no new one, but has been used by him for the last ten years in the instruction of students in South Kensington. I observe, however, that he has not made the same use of the trace to eliminate the zero error.

A. M. WORTHINGTON.

THE TOTAL ECLIPSE OF THE SUN, 1893.

AS I have been asked by some astronomers to give a description of the general appearance and climate of this part of Chile, in which a total eclipse of the sun occurs next year, I have drawn up for publication the following account:—

The eclipse takes place on April 16, 1893, at about 8.15 A.M., Chile local time, and will be seen to the greatest advantage in this part of the Province of Atacama.

At the sea coast the central line of total eclipse passes close to Chañaral 29° S.L. This is not the better known Chañaral, north of Caldera, but a small place equidistant from Coquimbo and Carrizal Bajo. The southern limit of total eclipse is 29° 50' S.L. just north of Coquimbo, and the northern limit 28° 10', just south of Carrizal Bajo.

The band of total phase stretches between these two limits in a north-easterly direction, across the country, from the coast towards the rising sun. Along the central line of this band the sun will be hidden by the moon for nearly three minutes. The eclipse will be total everywhere within the limits given above, but the total phase will be shorter and shorter the nearer those limits are approached, and outside of them the eclipse will be partial.

On the accompanying map of the Carrizal and Cerro Blanco and Copiapo Railway systems I have marked the northern and southern limits, and the central line of totality.

It will be seen that the port of Carrizal Bajo, 28° 4' S.L., is just outside the total band, but the railway connecting it with Yerba Buena intersects the central line of total eclipse 70 miles inland, and a branch to Merceditas, 60 miles inland, at an altitude sufficiently high to be above the damp and hazy atmosphere of the coast. At the points of intersection the climate is simply perfect for astronomical observations, and is also, during the month of April, delightful to live in.

The accompanying form was filled up, in compliance

- *Cloud Observations at "Mina Bronces," Chile, 1892.*

Local time.				Remarks.
Day.	7.45 a.m.	8.15 a.m.	8.45 a.m.	
April 10	2	2	2	Clouds were light, allowing a slight shadow to be cast. Bright sun at intervals.
" 11	2	0	0	Clouds were on the horizon, so that the sun rose above them at 8 o'clock.
" 12	0	0	0	Perfectly clear sky.
" 13	0	0	0	Perfectly clear sky. Sun rose at 6.22 a.m.
" 14	0	0	0	Sun rose at 6.22 a.m.
" 15	0	0	0	Fresh wind. Sun rose at 6.23 a.m.
" 16	0	0	0	Sun rose at 6.24 a.m.
" 17	0	0	0	
" 18	0	0	0	Slight haze at sunrise. Sun rose at 6.25 a.m.
" 19	2	0	0	Bank of clouds near north-east horizon, which the sun rose above at 8.05.
" 20	0	0	0	Sun rose at 6.26 a.m.
" 21	0	0	0	" " 6.27 "
" 22	0	0	0	" " 6.28 " Strong wind.
" 23	0	0	0	" " 6.29 " " "
" 24	0	0	0	
" 25	0	0	0	
" 26	0	0	0	
" 27	4	3	3	Haze thick at 8.15 a.m., but light at 8.45 a.m.
" 28	0	0	0	Sky got cloudy at midday.
" 29	0	0	0	
" 30	0	0	0	

KEY.

- 0 = "Sun entirely clear from clouds."
- 1 = "Clouds generally scattered."
- 2 = "Clouds massed about the sun."
- 3 = "Sun in haze or fog."
- 4 = "Sun invisible in thick clouds."

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with a request from Amherst College Observatory, to show the cloud conditions in the inland region during the month of April this year as an indication of what might be expected during the same month next year.

I had two series of observations made, one at Mina Bronces by Mr. Martin, chemist to the works (the results of which are hereto appended), the other at Cerro Blanco by Señor Miranda, at his mine. Both reports are in every respect alike. The 10th and 27th were cloudy, all the other days absolutely clear. As the two stations are some twenty-five miles apart, these reports show that there is no local weather, and that it is only when a general atmospheric disturbance, originating in the Cordillera de los Andes, occurs that the weather is affected at these high stations.

It will be seen that there was only one day—the 27th—out of twenty-one days of observation on which the sun was not visible at eight o'clock in the morning, for on the other cloudy day—the 10th—the sun was bright at intervals.

Observatory Stations.

I have marked on the map, along the central line of totality, several stations that I think suitable for observatories; the positions are only approximately correct, for I have no means of determining them accurately, but the errors, if any, cannot be great.

Undernoted are heights above sea level of some places shown on the map:—

Yerba Buena railway terminus ...	3867 feet
Cerro Blanco, north hill ...	10,000 "
" south, Peineta ...	8000 "
Carrizo, in the valley, a small farm ...	5000 "
Merceditas railway station ...	2900 "
Cerro del Jote ...	6000 "
Cerro del Cobre ...	8000 "
Lay observatory ...	4000 "

Cerro de Peineta is part of Cerro Blanco; this Cerro Blanco is not part of the Andes, but a detached hill with low ground all round, and a clear view to the north-east. It is easily ascended by pack-mules.

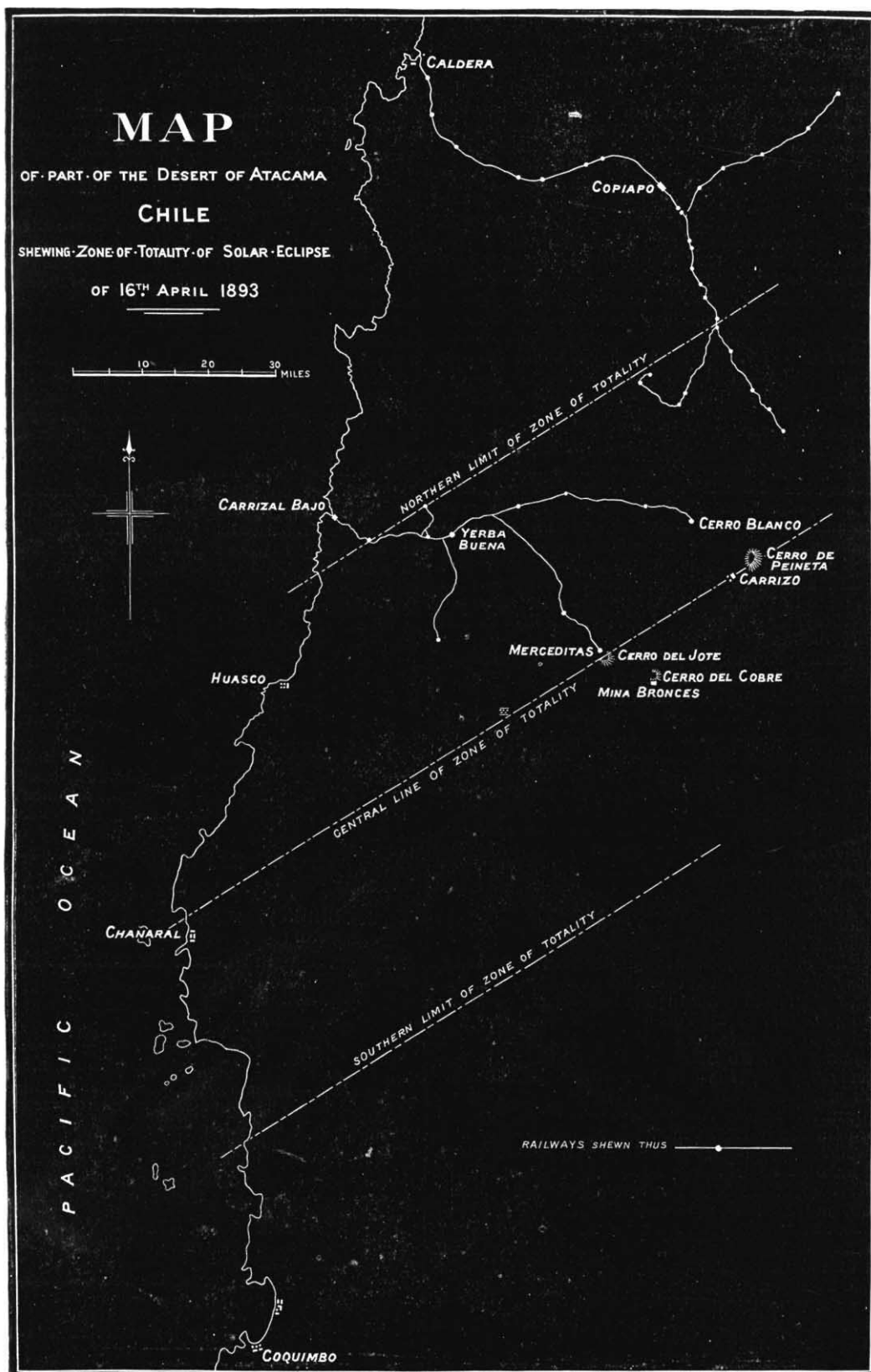
Carrizo is not a hill, but a small farm or large garden, irrigated by a mountain stream. The advantages of this station are: nearness to the railway, a good road, and plenty of small hills of easy ascent to select from.

Cerro del Cobre is a good hill, but probably too far south. However, there are hills all the way from Merceditas that might be selected (see Mr. Martin's letter).

Serra del Jote, near Merceditas, is accessible to pack-mules half-way up, higher than which it would not be necessary to go. Moreover, it is said that the rest of the ascent is difficult. The three hills, Cerro de Peineta, Cerro del Cobre, and Cerro del Jote, can all be seen from one another.

Lay Observatory. On April 15 I went to Merceditas and stayed overnight, as I wished to find near the railway station a hill on which the sun shone at an early hour on the morning of the 16th, through some opening among the surrounding hills, and which would be suitable for ordinary lay observers who had no expensive apparatus, but who wished to see the eclipse well through a smoked or coloured glass. To the south of the railway station I found a range of hills eminently suited to the purpose; at a height of 4000 feet above the sea the sun shone over a dent in the Jote at 6.40 a.m. The hill is much higher than 4000 feet, but I did not go higher. This is an excellent, well-sheltered spot, and would do well as a station for professional astronomers. I went up on horseback in forty minutes, but the ascent, from the railway station, could be easily made on foot in an hour. As I could not find any local name for this hill, I called it the Lay Observatory.

Climate.—At two o'clock in the afternoon of April 15



the temperature at Merceditas was 78° F.; this was the hottest time of the day, and it was a warmer day than usual, and at 8 p.m. the temperature was 62° F. Next morning, the 16th, I got up at two o'clock to see the comet then visible, and found the temperature was 58°; at 5 a.m. it was 56°.

Everywhere on the coast of Chile, north of Coquimbo, the sun, in the morning, is almost always obscured by a thick haze which makes the sky of a dull lead colour. This haze is sometimes driven away by the sun during the forenoon, but just as often it remains all day, especially during the months of March, April, and May.

This hazy morning atmosphere extends inland for a distance of about 40 miles and up to an elevation above the sea of about 2500 feet; beyond this distance and height the sky is almost always clear and the air dry. Standing, in the early morning, on a mountain of 3000 to 4000 feet, or higher, you look down on a great white sea of mist covered with whiter ridges like motionless waves, and studded here and there with islands, which are the mountain tops piercing through. This haze is usually gone by nine o'clock, except within about five miles of the sea.

Accommodation on the Hills.—Tents can be quickly and cheaply made with "esteros de totora," that is mats made of reeds. All the more temporary houses of miners and prospectors and of railway track repairers are made of these mats, which are seven feet square, and may be rolled up and carried from place to place. They form an article of commerce, and cost eighteen-pence each, or from eighty to ninety cents, of Chile paper currency. During all the month of April and part of May it is quite safe to trust to this kind of tent, but not later than the middle of May, for rain or snow sometimes falls in the end of that month.

There are no venomous reptiles in Chile, nor are there mosquitoes on these hills, and fleas cannot live at an altitude of 4000 feet—no slight advantage.

Rain.—On the Chilian side of the Andes, in the province of Atacama, rain generally falls twice in the year: the first rain is expected in June, the next in July, each rain usually lasting two days, and always accompanied with wind from the north. As soon as the wind changes to its prevailing quarter, the south, there is beautifully clear but cold weather. From two to three inches of rain fall in the year, but sometimes less than one inch. On Cerro Blanco it usually freezes every night from July till the end of August, and some snow lies on the mountain till September. On the hillsides there are plenty of bushes and small trees for firewood, and excellent water is found in all the higher valleys.

I have heard one objection to this district for observing the eclipse, which is, that as the eclipse takes place in the morning, and the sun is not high in the sky, it would be better to go farther east. This objection has no weight, on account of the extreme dryness of the atmosphere. At the mines on Cerro Blanco and the other hills everything gets dried up; Huasco raisins grow hard and rattle on one's plate like nuts; agricultural produce, such as wheat, beans, and barley, brought from Southern Chile as food for man and beast at the mines, loses two per cent. of its weight every month for several months, office ink bottles have to be kept tightly corked or the ink very soon dries up, chairs and tables fall to pieces, veneer peels off, and a piano soon loses its tone. The sky is dark blue, and the sun rises white and dazzling without a trace of any other colour. The hills, the rocks, and the bushes cast dark shadows, and even every pebble the size of a hazel nut casts its shadow, so that in the early morning the gravelly ground seems half wetted with a shower; one side of every pebble is in bright light, the opposite in deep shadow.

Although the eclipse would be the object of greatest

interest to visitors, a few weeks might be profitably spent among the copper mines, and if any one wished to become a mine owner, plenty of mines are to be had for the asking. All the mines belong to the State. You have only to take up a mine, pay a nominal licence to the Government annually, and the mine is yours as long as you pay the licence. There are no royalties, no surface rents, and no export duties. The next thing to do is to make the mine pay, and this is sometimes done.

There is no sport in April, but after snow falls on the Cordillera, huanacos and immense flights of turtle-doves come down to feed on the lower slopes. Life, however, is never wanting. The region from Cerro Blanco southward as far as Coquimbo is the home of the fur chinchilla. It feeds on the nut of the carbon tree, *Cordia decandra* (Hook. et Arn.), and on the pea of the algarrobillo, *Balsamocarpion brevifolium* (Clos.). This bush, which produces the tannin pod of commerce, thrives best far inland, on sunny, almost rainless slopes, but it must have one shower in June or July, otherwise it bears no fruit. If there be no rain for three or four years—as sometimes happens—the bushes do not die—they just wait. The same thing happens with all the other bushes; sometimes, for several successive years, they are without leaves, and though the soil seems as dry as dust, whenever rain comes they show themselves full of life.

British astronomers—professional and amateur—ought not to lose the opportunity of observing under such favourable circumstances this great eclipse. I doubt if better conditions were ever offered before. The distance to come is long, but the expense is not very great, and can be exactly counted beforehand. An expedition might leave Liverpool in February, by Straits of Magellan steamer, and be home again in June. Or, after the eclipse, go by steamer to San Francisco or Vancouver, and thence by rail to the World's Fair at Chicago, and instead of encountering hardship and danger in some unhealthy climate, have a pleasant trip all the way.

Though horses and mules can be got here, every one should bring a saddle and bridle.

In conclusion I would impress on the members of every expedition that may come out, the importance of selecting, as observing stations, places at a distance of at least 60 or 70 miles from the sea. On the other hand, the advantages of going farther inland are doubtful, and as the railways go no farther, travelling would be more difficult.

JOHN KING,

British Vice-Consul, Carrizal Bajo, and Engineer
of the Carrizal and Cerro Blanco Railway.

Carrizal Bajo, Province of Atacama, Chile,
May 1892.

(COPY OF MR. MARTIN'S LETTER.)

Mina Bronces, Jarilla, May 2, 1892.

DEAR SIR,—I have now the pleasure of enclosing the form which you sent to be filled up. As I did not receive your letter till April 9, I could not of course fill in the first nine days, but as you will see by the observations that as the last twenty days have been almost invariably clear, I think the astronomers could safely decide to come here as far as clearness of sky is concerned.

An observatory could very easily be placed on one of the spurs of the Cerro del Cobre, to the south of the latter. It is easily accessible to mules with 250 pounds and affords an uninterrupted view of the sunrise.

Hoping that the filling up of the form will be found to fulfil all requirements. I remain, dear sir,

Yours sincerely,
(Signed) WILLIAM M. MARTIN.

John King, Esq., Carrizal Bajo.